Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

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Editorial

Equanimity in the time of COVID: The past ameliorates the present

1. Introduction

In times of duress, a back to basics approach can restore balance. The global chaos of COVID-19 has challenged healthcare professionals, but also inspires us to look at our innate capabilities for optimizing wellness. It is imperative to equip anesthesiologists with self-care tools so they can continue providing quality patient care.

Time-honored contemplative practices, such as meditation and yoga, are underutilized, but powerful adjuncts to daily life. One commonality between these insight-driven activities and human physiology is the focus on breathing. When actively regulated, breath control ameliorates the response to physical and emotional stress, improving health.

As anesthesiologists, we understand the physiology of breathing intimately, granting us the ability to keep patients alive. This skill is why our specialty has the expertise to manage some of the most critical moments of patient care during this year's pandemic. However, as autonomous as the praxis of breathing is, we must not underestimate its profound effect on our own physiology and well-being.

2. Contemplative practices: role in physician wellness

The concept of wellness, rooted in eastern philosophies, has now transitioned to the current western model. The World Health Organization defines *wellness* as a "state of physical, mental and social well-being and not merely the absence of disease or infirmity." [1]. The National Wellness Institute defines the term as a "conscious, self-directed, and evolving process of achieving full potential." [2]. Wellness is an active process, mitigating illness, and improving overall quality of life [3]. Since conventional modalities of stress management (gym classes or socially driven programs) are restricted at present, alternative therapies should be explored.

Contemplative practices incorporating controlled breathing are practical and transformative, allowing one to develop capacities for quieting the mind. In eastern philosophy the role of breathing to achieve control over the mind and influence actions is undisputed. In western culture, there is an understanding that breath control reduces stress. These practices contribute to further development of empathy, improvement of focus, and enhancement of creativity – skills helpful in optimizing patient care [4].

A common misconception is that contemplative practices must coexist with religion; there are no specific beliefs required to benefit from this discipline. These practices can be viewed as a shared language which can cross social, cultural, and spiritual boundaries.

3. Contemplative practices: ancient science to modern medicine

Yoga is a systematic discipline for overall health practiced in physical postures (*asanas*), controlled breathing (*pranayama*) and concentration techniques (*meditation*) to unify mental and physical health.

The science of Yoga was codified around 400 CE, with interest as an adjunct to western medicine dating back to the 1970s. Prior documentation noted the human ability to utilize breathing techniques to induce rapid atrial fibrillation, increase body temperature by 10 °F, and voluntarily enter into a delta brain wave state while recalling concurrent conversations. Unfortunately, these demonstrations of mind-body physiologic control were overlooked due to their lack of statistical significance [5].

Continued investigations have improved research methodology and developed applications for chronic stress-related medical conditions, establishing credibility within the medical community [6–9]. More recently, Wim Hof has presented a version of pranayama which allows him to withstand temperature extremes [10,11]. Hof believes exposure to the cold, combined with breathing exercises, can mitigate disease.

Currently, the emphasis on postures has popularized Yoga, diminishing the vital role of breathing to the practice. We will reinforce the respiratory aspect of yoga as a high-yield tool for well-being.

4. Pranayama: overview, influences on physiology, and applications

4.1. Overview

Prana means life force, translated as breath, and *yama* means control; effectively *pranayama* is defined as conscious breath control.

Central to the philosophy of pranayama is diaphragmatic breathing - deep breathing involving the diaphragm rather than the accessory muscles. Regulated pranayamic exercises require inhalation, maintaining isometric contraction of respiratory muscles and forceful expiration. These techniques will strengthen respiratory muscles. There are several forms of pranayama that have been described; the most common techniques are listed in Table 1. Each type can produce specific physiological responses based on the duration of practice, length of breathing cycle, size of tidal volume and constriction of the laryngeal muscles. Modern variants of pranayama integrate anatomical knowledge with traditional teachings to explain the benefits of this practice.

The impact of ancient breathing techniques can be illustrated using concepts of basic respiratory physiology. In an average 70 kg adult, tidal volume (TV) and inspiratory reserve volume (IRV) are accepted as 500 mL and 3000 mL respectively. The *inspiratory reserve capacity* (*IRC*) equals the TV (500 cc) + IRV (3000 cc). This means that deep breathing can distend the lungs to ~3500 mL, significantly more than

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Table 1
Common pranayama techniques.

Type of pranayama	Description of practice
Ujjayi (victorious breath)	Breath through nostrils at a normal pace, with deliberate contraction of the larynx. Considered throat breathing. Builds internal heat, while still calming the nervous system
Nadhi Sodhana (unilateral nostril breathing)	Commonly used in contemporary yoga classes. Helps direct attention to the present moment. Alternate nostril breathing, does not use throat to control breath.
Kapalabhati (skull cleansing)	Deliberately breathe faster and engage in diaphragmatic breathing, not chest breathing. Specifically used as a cleansing breath.
Bhastrika (bellow breathing)	Shares same general principle with Kapalabhati and both clear nasal passages and chest. Breathing engages the abdominals, where they move like bellows.

the 500 mL of a normal breath. Additionally, the surface area of alveoli can stretch from 70 m^2 in a normal breath to 100 m^2 on deep inhalation. The combination of IRC plus 30% more surface area will increase alveolar gas exchange and decrease dead space ventilation. This translates into increased breath retention, improved maximal oxygen uptake, and efficient oxygen utilization by tissues, all positive predictors of health [12,13].

4.2. Autonomic physiology

Conventional wisdom holds that the autonomic nervous system is independently and subconsciously controlled. However, since pranayama can be performed with either slow or rapid breaths, this conscious breath regulation can shift autonomic dominance.

Slow breathing with long breath retention decreases oxygen consumption and metabolic rate, enhancing parasympathetic activation. Contrarily, rapid rate breathing increases oxygen consumption, metabolic rate and removal of free radicals, enhancing sympathetic activation [14].

Numerous studies detail the beneficial effects of breath regulation on cardiac autonomic activity [14–16]. A randomized control trial involving 90 healthcare students compared the effects of training in slow versus rapid pranayama for 3 months. While this showed a reduction in perceived stress in both groups, only the slow pranayama group showed reduced heart rate (HR) and blood pressure (BP) [15].

A study compared the effect of 5 min of slow pranayama on HR and BP, with and without oral administration of hyoscine-N-butylbromide (Buscopan), a parasympathetic blocker drug. Decreases in cardiac parameters were noted in the group who practiced pranayama with no medication, whereas subjects taking Buscopan did not show notable changes in BP or HR. The study concluded that the modulation of ANS due to the practice of slow-paced breathing is attributed to enhanced parasympathetic activity [16].

Further investigation at the cellular level will reveal why parasympathetic dominant physiology occurs during breath regulation [14]. In the interim, the literature supports that contemplative practices attenuate the stress response.

4.3. Immunologic physiology

Alterations at the molecular pathway were looked at in the proteomic profile of saliva (parasympathetic response) produced after engaging in a 20-minute pranayamic practice. Two biomarkers, involved in tumor suppression and innate immunity, were significantly elevated in the pranayama group and undetectable in the control group. This data suggests that increased vagal tone secondary to habitual breathing practices, can improve immunity and reduce cancer risk [17].

Increased immunity has also been studied in high frequency pranayama techniques, specifically the Wim Hof method. Controlled-hyperventilation, increases internal body temperature and induces a brief respiratory alkalosis, which is postulated to be within a hormetic range. The concept of hormesis follows an adaptive response of cells to an intermittent stressor. This voluntary stress theoretically leads to more resilience and a sense of control in handling everyday challenges.

The Wim Hof method notes changes in ABG values and the beneficial effects of activating the sympathetic system in response to a pathogen [10,11]. Healthy volunteers were stratified into a control and intervention group. The intervention group was trained in Wim Hof strategies (temporary induction of intermittent respiratory alkalosis and hypoxia). All subjects then underwent experimental low-dose endotoxemia (IV E-coli endotoxin). The intervention group produced significant increases in endogenous epinephrine and anti-inflammatory cytokines (IL-10) [10,11]. This clinical picture illustrates that breathing exercises can improve one's immunity naturally, an important consideration during the pandemic.

5. Applications for well-being

Between clinics and the operating rooms, physicians must somehow fulfill demanding responsibilities, maintain focus on the patient in front of them, and foster their well-being, while possessing limited tools. Ideally, broader system-wide preventative strategies addressing physician burnout will emerge. In an immediate scenario, physicians can develop individually-driven wellness methods that are simple, efficient, and effective.

Conscious breath control is a PPE that can be donned anywhere - prior to work, during a commute, in the office, or before entering a patient's room. Guidance on how to perform these techniques is beyond the scope of this article, as the technique is dependent on the needs of the individual. However, simple techniques - such as gentle diaphragmatic breathing and comfortably lengthening the exhalation phase - can be used at any time to transform the breath and the state of mind.

Science supports the validity of the controlled breath, an ancient practice, which naturally detoxifies and rejuvenates the mind and body. Various forms of pranayama exist, promoting breath-holding and rapid respiratory rates, akin to altering parameters during mechanical ventilation. Studies have yielded that pranayama enhances immunity, improves cardiovascular fitness, modulates chronic disease, increases longevity and delivers a sense of well-being. Given these benefits, breath regulation is an important tool in the armamentarium of the anesthesiologist — as a countermeasure to daily physiologic stressors, particularly, heightened by COVID-19.

Declaration of competing interest

None.

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